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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :
G11B 17/00, 27/02, 25/04

A1

(11) International Publication Number: WO 94/12981

(43) International Publication Date: 9 June 1994 (09.06.94)

(21) International Application Number: PCT/KR92/00069

(22) International Filing Date: 30 November 1992 (30.11.92)

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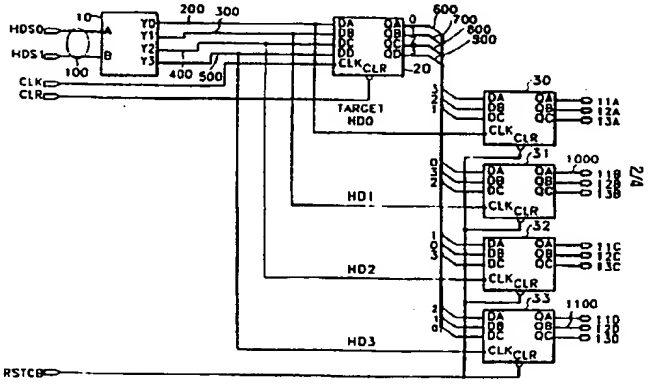
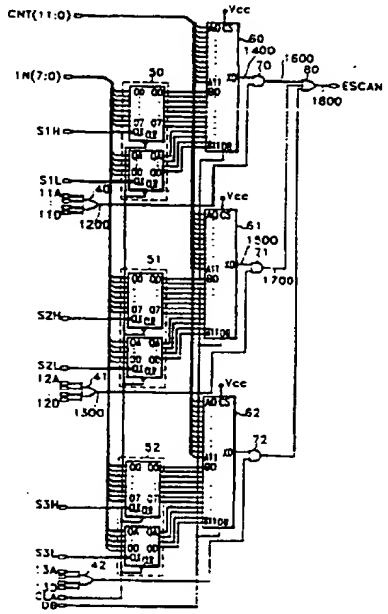
(81) Designated States: AU, CA, GB, JP, US.

Published
With international search report.

(54) Title: HEAD SWITCHING METHOD FOR STAGGERED SERVO AND CIRCUIT THEREOF





(57) Abstract

A head-switching circuit for switching a first head operating on a first recording medium to a second head operating on a second recording medium so as to read out data written on a recording medium according to a staggered servo mechanism, includes a selector for selecting one of the recording media, a classifier (20, 30, 31, 32 and 33) for classifying the skew time of a recording medium selected by the selector and another recording medium selected by the selector, a sync signal generator (40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 72 and 80) enabled by the output signal of the classifier and for generating a sync signal when the skew time is indentical with a predetermined time, thereby generating a sync signal precisely during head-switching in staggered servo mechanism.

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HEAD SWITCHING METHOD FOR STAGGERED SERVO AND CIRCUIT THEREOF

Technical Field

The present invention relates to a magnetic recording device, and particularly to a head-switching method for a staggered servo and circuit thereof.

Background Art

Fig.1 illustrates a method for writing sector identification codes (sector ID code) for distinguishing sectors during head-switching in a conventional servo mechanism.

Referring to Fig.1, in a servo mechanism, when disks are placed in a vertical arrangement, sector ID codes for distinguishing the sectors are vertically aligned with each other. If the sector ID codes are written as shown in Fig.1, after sector ID codes are completely written on a disk surface, then sector ID codes are written on a next disk surface, so that the writing time takes as much as the rotation number corresponds to the number of disk surfaces, causing the time to be lengthened.

Fig.2 illustrates a method for writing sector ID codes for distinguishing sectors during head-switching in a conventional staggered servo mechanism.

Referring to Fig.2, in the conventional staggered servo mechanism, since the sector ID codes are written by skewing according to a skew value, for one rotation, the sector ID codes are completely written on the overall disk surfaces, thereby shortening the recording time. However, in the conventional method of the staggered servo mechanism, a sector ID code is detected while skipping one or two sectors. In other words, when a head is switched from disk HD0 to disk HD1, point A, which is a data area, is forecast as the location of a next sector ID code to repeat the detection operation, so that one or two sector ID codes are skipped or a data read error is created.

Disclosure of Invention

Therefore, it is an object of the present invention to provide a head- switching method which precisely detects a sector ID code written according to a staggered servo mechanism during a head-switching operation.

It is another object of the present invention to provide a head-switching circuit which precisely detects a sector ID code written according to a staggered servo mechanism during a head-switching operation.

To accomplish the first object, there is provided a head-switching method for switching a first head operating on a first recording medium to a second head operating on a second recording medium so as to read out data written on a recording medium according to a staggered servo mechanism, the method comprising: a selecting step for selecting one of the recording media; a classifying step for classifying the skewing time of a recording medium selected by the next selecting step and recording medium selected by the selecting step; a sync signal generating step for generating a sync signal when the skew time is identical with a predetermined time.

To accomplish the second object, there is provided a head-switching circuit for switching a first head operating on a first recording medium to a second head operating on a second recording medium so as to read out data written on a recording medium according to a staggered servo mechanism, the circuit comprising: selecting means for selecting one of the recording media; classifying means for classifying the skew time of a recording medium selected by the selecting means and another recording medium selected by the selecting means; sync signal generating means enabled by the output signal of the classifying means and for generating a sync signal when the skew time is identical with a predetermined time.

Brief Description of Drawings

The above objects and other advantages of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings in which:

Fig.1 illustrates a method for writing sector identification codes for distinguishing sectors during head-switching in a conventional staggered servo mechanism;

Fig.2 illustrates a method for writing sector ID codes for distinguishing sectors during head-switching in a general staggered servo mechanism, to which the prior art and the present invention may be applied;

Fig.3 illustrates a method for, when a head of a current disk surface is switched to a head of another disk surface, finding the location of the sector ID codes on the other disk surface by using a skew value;

Figs.4A and 4B are the block diagram of a circuit for compensating for a skew value during head-switching, according to the present invention; and

Fig.5 is a timing diagram for explaining the operation of the circuit shown in Figs.4A and 4B.

Best Mode for Carrying out the Invention

First, a sector detecting method for use during the head-switching of the present invention will be described below with reference to Fig.2.

In Fig.2, in compensating for a skew value during head-switching, in order to detect a sector ID code written in one detection operation so as to be skewed as much as the skew value, but without skipping the sector ID code, the sector detecting method for use during head-switching of the present invention compares the location of a current head and the location of a target head and generates a signal so as to forecast a servo identifying location. If data is written on the four surfaces of two hard disks, three skew values are created.

Here, to illustrate the head-switching method and apparatus for a staggered servo of the present invention, Fig.2 is adapted and it is assumed that data is written on the four surfaces of two hard disks and the time for writing data on a sector is 260.417μs. The skew value is 260.417μs/4=65.104μs when disk HD0 is switched to disk HD1.

The skew values according to head-switching and resultant values which indicate the time required for actual head-switching operation, are calculated as follows.

current head → next head	skew value	resultant value
HD0 → HD1 HD1 → HD2 HD2 → HD3 HD3 → HD0	65.104μs	60.604μs
HD0 → HD2 HD1 → HD3 HD2 → HD0 HD3 → HD1	130.208μs	125.708μs
HD0 → HD3 HD1 → HD0 HD2 → HD1 HD3 → HD2	195.312μs	190.812μs

A method for calculating the resultant values shown in the above table is explained with reference to Fig.3.

Referring to Fig.3, the resultant values are calculated by the equation of skew value − post amble value − normal gap. Here, the normal gap indicates the distance between a postamble and a preamble. The above table is obtained when the post amble value is 3.375μs and the normal gap is 1.125μs.

Referring to Figs.4A and 4B, two input signals are required in head-switching the four surfaces of two hard disks. A decoder 10 receives two input signals HDS0 and HDS1 to generate signals for selecting disks HD0, HD1, HD2 and HD3. A latch 20 receives and latches the outputs of decoder 10. A latch 30 receives and latches the fourth, third and second outputs of latch 20. A latch 31 receives and latches the first, fourth and third outputs of latch 20. A latch 32 receives and latches the second, first and fourth outputs of latch 20. A latch 33 receives and latches the third, second and first outputs of latch 20. The latches 30, 31, 32, and 33 output latched signals in response to the output signal of the decoder 10.

An OR gate 40 receives and OR-operates the first outputs of latches 30, 31, 32

and 33. An OR gate 41 receives and OR-operates the second outputs of latches 30, 31, 32 and 33. An OR gate 42 receives and OR-operates the third outputs of latches 30, 31, 32 and 33.

A counter 50 counts a first skew value designated by the user. A counter 51 counts a second skew value designated by the user. A counter 52 counts a third skew value designated by the user. A comparator 60 compares a count signal counted from the start point of the head-switching operation with the output signal of counter 50, to determine whether a match exists. Likewise, a comparator 61 compares a count signal counted from the start point of the head-switching operation with the output signal of counter 51, to determine whether these match. Further, a comparator 62 compares a count signal counted from the start point of the head-switching with the output signal of counter 52, to determine whether a match exists here.

An AND gate 70 AND-operates the output signal of comparator 60 and the output signal of OR gate 40. An AND gate 71 AND-operates the output signal of comparator 61 and the output signal of OR gate 41. An AND gate 72 AND-operates the output signal of comparator 61 and the output signal of OR gate 42. An OR gate 80 OR-operates the output signals of AND gates 70, 71 and 72.

Referring to Fig.5 which is a timing diagram for the operation of the circuit shown in Figs.4A and 4B, a decoder 10 receives and decodes signals 100 for selecting a disk. If "00" is input to select first disk HD0, signal 200 becomes high. Latch 20 latches signal 200 to generate signal 600. Being synchronous with signal 300, latch 31 latches output signal 200 of latch 20 to generate signal 1000. To select hard disk HD1, "01" is input to signal 100. Decoder 10 receives and decodes "01" to output signal 300. Latch 20 receives signal 300 to generate signal 700. Being synchronous with signal 500, latch 33 receives signal 700 to generate signal 1100. OR gate 40 generates a high level signal 1200 due to signal 1000. OR gate 41 generates a high level signal 1300 due to signal 1100.

If a value (that is, a skew value) designated by counter 50 and the value counted from the start point of a sector match, comparator 60 generates signal 1400. If a value designated by counter 51 and the value counted from the start point of a sector match, comparator 61 generates signal 1500. AND gate 70 receives signal 1400 to generate signal 1600. AND gate 71 receives signal 1500 to generate signal 1700. OR gate 80 OR-operates signals 1600 and 1700 to generate signal 1800.

Accordingly, in the head-switching method and circuit for reading out data written on a medium according to the staggered servo method of the present invention, a skew value of each sector identification code can be compensated for during head-switching to precisely find the start point of a sector.

Industrial Applicability

The present invention can be employed in systems for reading data recorded on a medium according to a staggered servo mechanism, for instance, hard disk drives.

In the claims

1. A head-switching method for switching a first head operating on a first recording medium to a second head operating on a second recording medium so as to read out data written on a recording medium according to a staggered servo mechanism, said method comprising:

a selecting step for selecting one of said recording media;

a classifying step for classifying the skewing time of a recording medium selected by the next selecting step and recording medium selected by said selecting step;

a sync signal generating step for generating a sync signal when the skew time is identical with a predetermined time.

2. A head-switching circuit for switching a first head operating on a first recording medium to a second head operating on a second recording medium so as to read out data written on a recording medium according to a staggered servo mechanism, said circuit comprising:

selecting means for selecting one of said recording media;

classifying means for classifying the skew time of a recording medium selected by said selecting means and another recording medium selected by said selecting means;

sync signal generating means enabled by the output signal of said classifying means and for generating a sync signal when the skew time is identical with a predetermined time.

3. A head-switching circuit for switching between four recording surfaces so as to read out data recorded on a recording medium according to a staggered servo mechanism, said circuit comprising:

selecting means for receiving two input signals to select one recording medium;

latching means for latching a signal selected by said selecting means;

classifying means for classifying the signal latched by said latching means according to the skew time of a first-selected recording medium and a next-selected recording medium, taking the signal output by said selecting means as an enable signal;

sync signal generating means for comparing a signal counted from the start point of sectors of each recording medium and a signal corresponding to the skew time of each pre-defined recording medium, and if said sectors match, generating a sync signal.

4. A head-switching circuit as claimed in claim 3, wherein said selecting means is composed of a decoder for receiving two input signals to generate four output

signals.

5. A head-switching circuit as claimed in claim 3, wherein said classifying means comprises:

first classifying means for latching fourth, third and second output signals of said latching means;

second classifying means for latching first, fourth and third output signals of said latching means;

third classifying means for latching second, first, and fourth output signals; and

fourth classifying means for latching third, second and first output signals of said latching means.

6. A head-switching circuit as claimed in claim 3, wherein said sync generating means comprises:

first OR-operating means for OR-operating the first output signals of said classifying means;

second OR-operating means for OR-operating the second output signals of said classifying means;

third OR-operating means for OR-operating the third output signals of said classifying means;

first counting means for counting a first time period;

second counting means for counting a second time period;

third counting means for counting a third time period;

first comparing means for comparing said period counted from the start point of the sector and a count signal of said first counting means;

second comparing means for comparing said period counted from the start point of the sector and a count signal of said second counting means;

third comparing means for comparing said period counted from the start point of the sector and a count signal of said third counting means;

first AND-operating means for AND-operating the output signals of said first OR-operating means and said first comparing means;

second AND-operating means for AND-operating the output signals of said second OR-operating means and said second comparing means;

third AND-operating means for AND-operating the output signals of said third OR-operating means and said third comparing means; and

sync signal generating means for OR-operating the output signals of said first, second and third AND-operating means to generate a sync signal.

FIG. 1

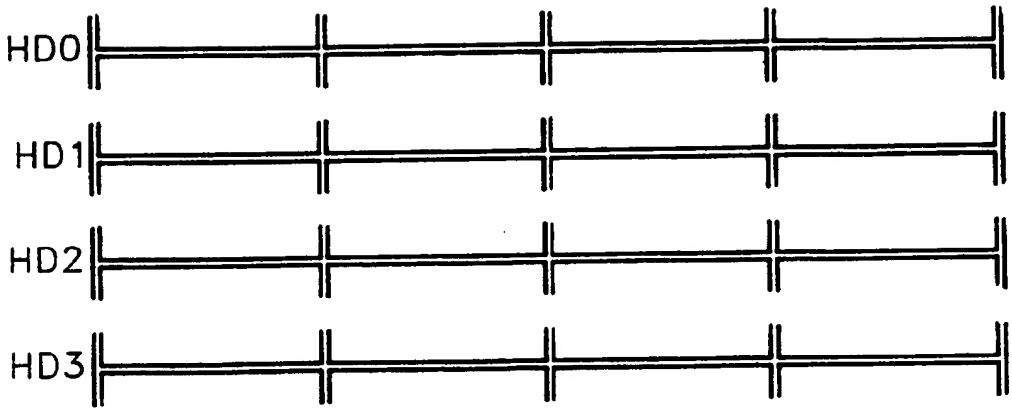


FIG. 2

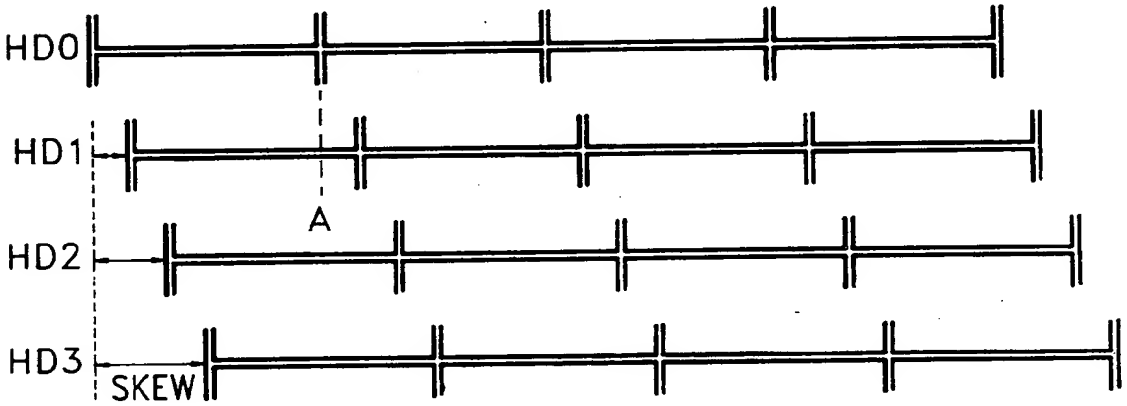
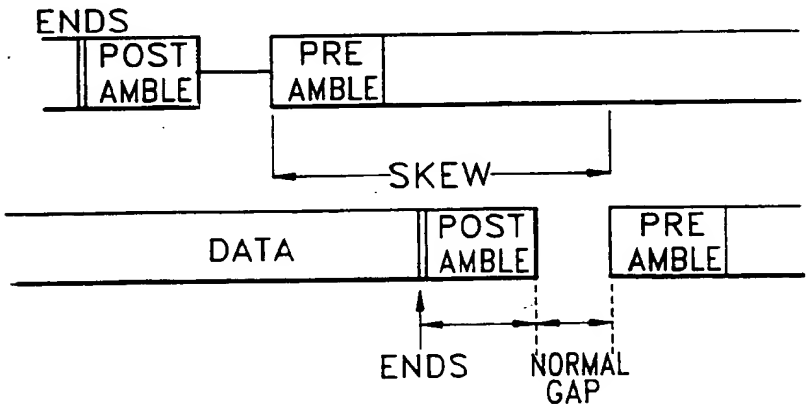
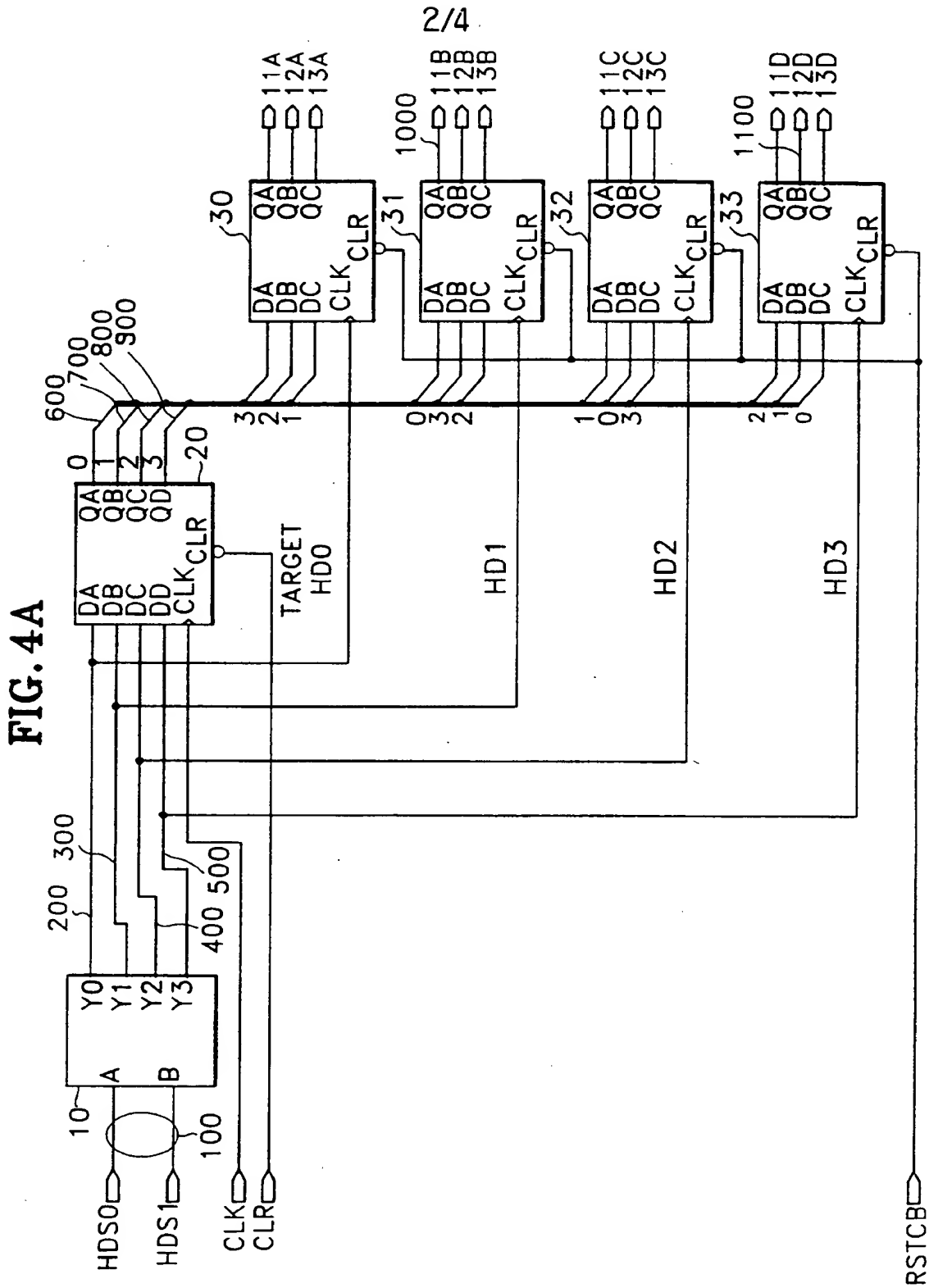


FIG. 3

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13C
11D
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QA
QB
QC
DA
DB
DC
CLK
CLR
600
700
800
900
0
1
2
3
20
QD
DD
TARGET
HD0
HD1
HD2
HD3
300
200
400
500
Y0
Y1
Y2
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B
10
100
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HDS1
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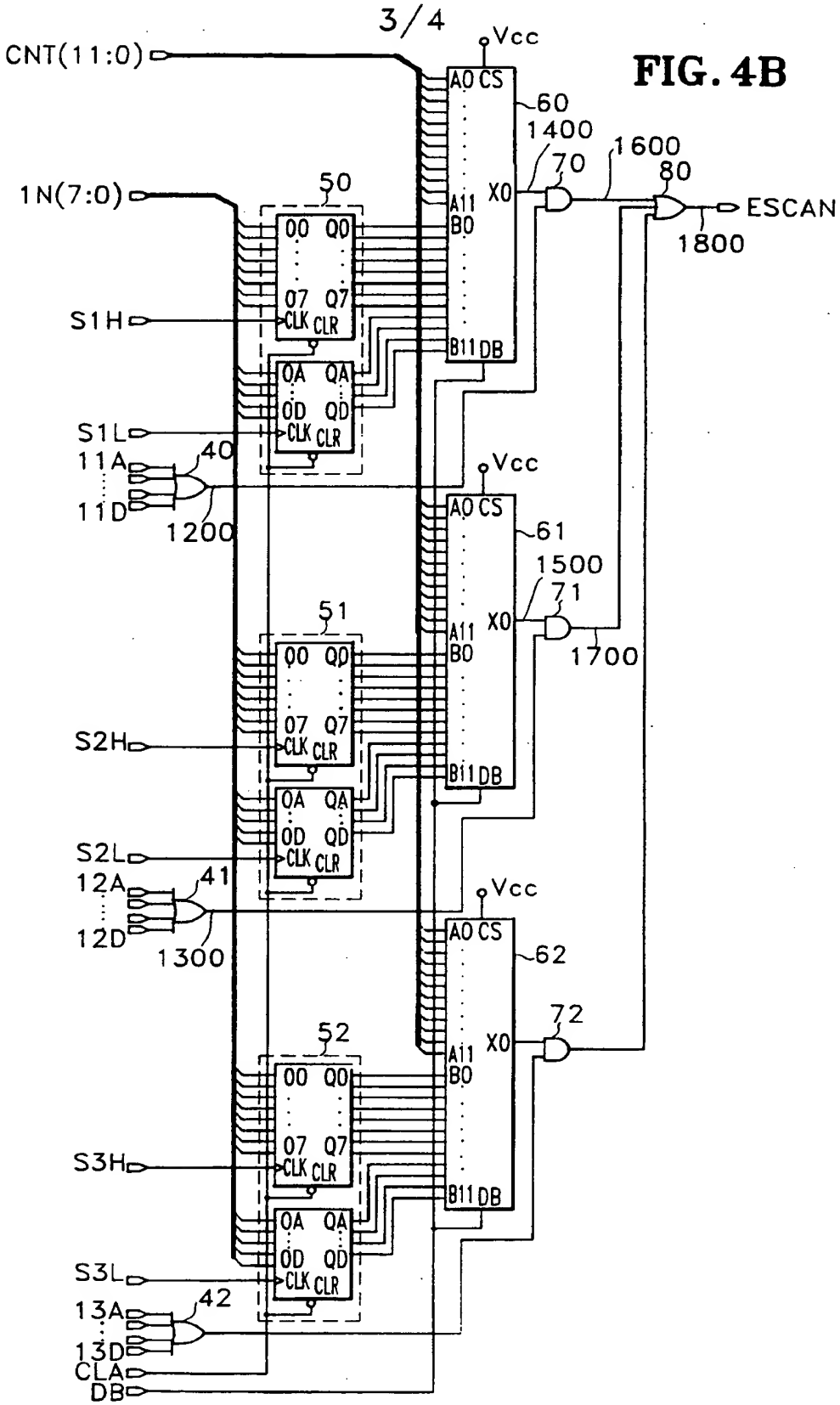
CLR
RSTCB

FIG. 4A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1N(7:0)
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S1L
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11D
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S2L
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12D
41
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S3H
S3L
13A
13D
42
CLA
DB
50
51
52
Q0 Q0
Q7 Q7
CLK CLR
QA QA
QD QD
Vcc
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A11
B0
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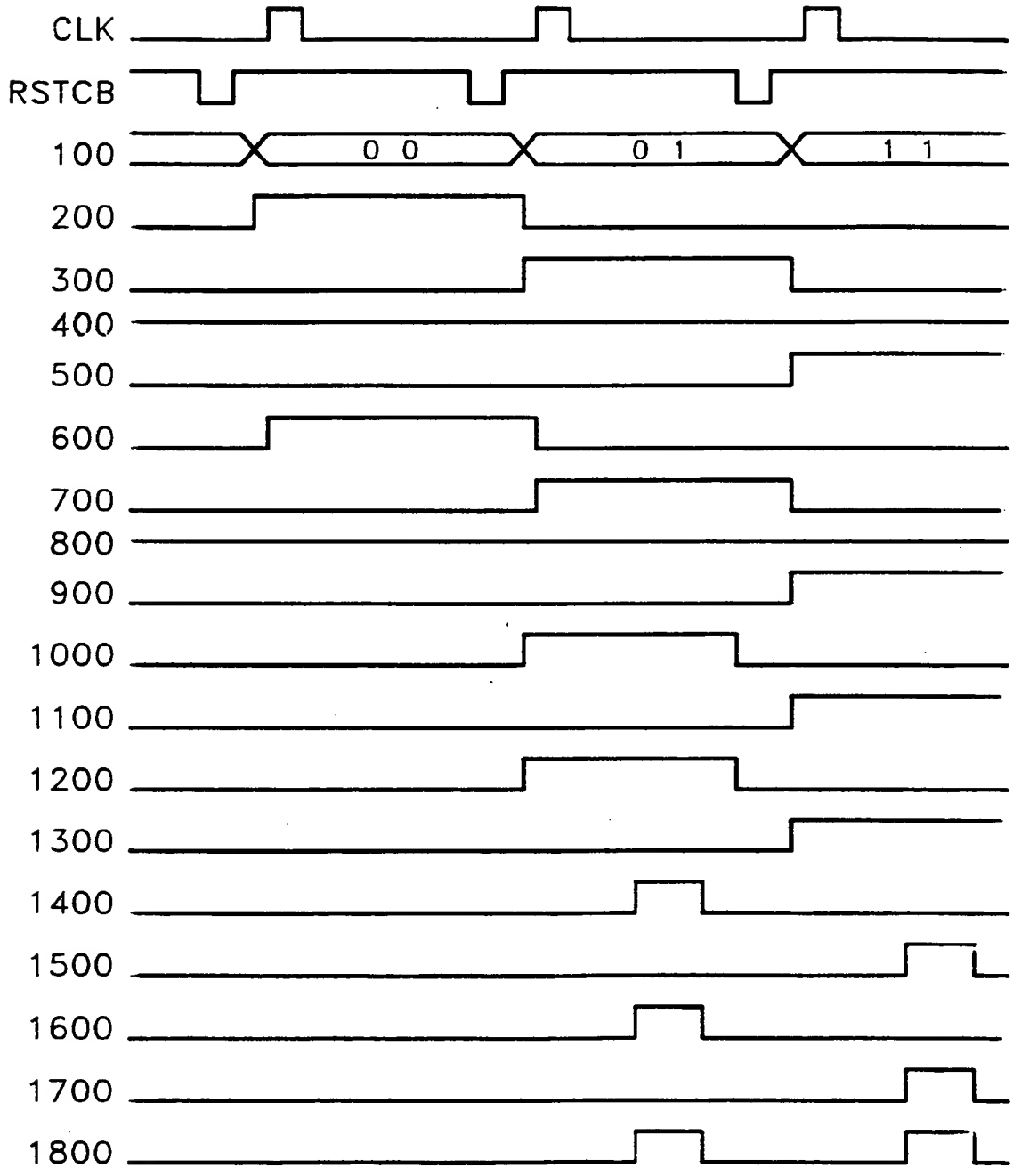
FIG. 4B

FIG. 5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1500
1600
1700
1800

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR 92/00069

A. CLASSIFICATION OF SUBJECT MATTER

IPC[5]: G 11 B 17/00, 27/02, 25/04

According to International Patent Classification (IPC) or to both national classification and IPC

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4 388 713 (TATSUGUCHI) 14 June 1983 (14.06.83), fig. 3,5,8; claim 1.	1-6
A	FR, A1, 2 487 559 (VICTOR COMPANY OF JAPAN LTD.) 29 January 1982 (29.01.82), fig. 5,6; claim 1.	1-6
A	GB, A, 2 140 958 (NIPPON VICTOR K.K.) 05 December 1984 (05.12.84), fig. 12; claim 1.	1-6

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Date of the actual completion of the international search	Date of mailing of the international search report
16 July 1993 (16.07.93)	03 August 1993 (03.08.93)

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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		DE C2 3049045	28-08-86
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		JP A2 56094547	31-07-81
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		DE C2 3331107	04-07-85
		FR A1 2547095	07-12-84
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		US A 4563709	07-01-86